

## FY 2003 Year End Self Evaluation Report

### IDENTIFICATION:

Critical Outcome:	1.0	Excellence In Science & Technology
Objective:	1.1	Quality of Research
Performance Measure:	1.1.1	High Energy and Nuclear Physics
Metric:	1.1.1.1	Collider Accelerator Department
Responsible:	D. Lowenstein	OMS Proj Mngr: Bruce Miller % of Critical Outcome:

### APPENDIX B DESCRIPTION:

Depending on the nature of the Collider Accelerator Department of High Energy and Nuclear Physics Research performed, reviewers will consider the following:

Science: Success in producing original, creative scientific output that advances fundamental science and opens important new areas of inquiry; success in achieving sustained progress and impact on the field, and recognition from the scientific community, including awards, peer-reviewed publications, citations, and invited talks.

Technology: Whether there is a solid technical base for the work, the intrinsic technical novelty of the research, the importance of technical contributions made to the scientific and engineering knowledge base underpinning the technology program, and recognition from the technical community.

### RESULTS:

### ACCOMPLISHMENTS:

Significant Accomplishments:

1. This last running cycle, RHIC operated for the first time with unequal mass ion species. This is a first for high energy colliders. The ion run of deuterons upon gold was operated at 100 GeV / nucleon and above design luminosity. This operation mode provided the data for the 4 experiments to confirm that a new hot and dense form of matter is produced in gold upon gold collisions.
2. Polarized proton collision operations had its full complement of Siberian Snakes and spin rotators installed and operational. Despite the failure of 1 magnet in a snake chain of 4 magnets, polarization was routinely delivered at 30% polarization and above design luminosity.
3. The AGS Siemens motor generator set was repaired and brought back into operation. The AGS therefore was able to deliver proton polarizations of 50% for RHIC operations.
4. The Booster Applications Facility Project (BAF) was completed on schedule, below cost and met beam specifications.
5. The NASA Space Radiation Laboratory (NSRL) started research operations upon the completion of BAF.
6. The BNL part of the SNS Project at ORNL continued to meet all construction milestones at or below estimated costs. FY2003 is the peak of the BNL activity for this project.

**Significant Awards:**

- D. Phillips - Environmental Stewardship Award
- A.J. McNerney - IEEE Region 1 Award for Electrical Engineering Management

**Publications:**

No. of Peer Reviewed Pubs:	6	No. of Refereed Pubs:	9
No. of Internal Reports:	20	No. of Invited Papers:	12
No. of Books:	0	No. of Conf Proceedings:	158
No. of Other Pubs:	1		

**Patents, Disclosures, Licenses and Royalties:**

- Disclosure: Binocular Stereoscopic Viewing System for X-Ray and Gamma-Ray Luggage and Cargo Inspection Stations, P. Thieberger, 11/02.
- Disclosure: Zener-diode Voltage Divider for Low-Energy, High-Intensity Electrostatic Accelerators, P. Thieberger, 10/02.
- Disclosure: Regulation of Low Energy Particle Accelerators by Using Resonances in Nuclear Reactions, P. Thieberger, 10/02.
- Patent No. 6,575,041, Capacitive Strain Gage and Method, M. Kesselman, 6/03.
- Patent No. 6,528,949, Plasma Valve, A. Hershcovitch, 3/03.
- Patent No. 6,515,487 B1, Low Voltage Low Current Bubble Detection Circuit, W.C. Dawson, 2/03.

**Significant New Hires:**

- Twelve new hires and transfers into C-A from other BNL Departments
  - One Senior Scientist
  - One Associate Scientist
  - Two temporary PhD students
  - Two Research Associates
  - Six replacements for staff lost through attrition
- C-A also supporting four graduate students in Accelerator Physics.

**Proposals**

- RHIC - Collider-Accelerator Operation
- RHIC Experiment Operations (partial)
- Accelerator and Experimental Facility Operations for HEP
- Accelerator and Experimental Facility Operation for Medium Energy Physics
- Spallation Neutron Source Project
- NASA - NASA Space Radiation Laboratory (NSRL)
- NASA - Genetic and Epigenetic Effects - E966
- Proton Radiography - E963

**LDRD Initiatives:**

None

**Editorial Activity and Major Book Articles**

- Editor, Beam-Beam'03 Workshop Proceedings, W. Fischer.
- Editors, 2002 Beam Instrumentation Workshop Proceedings, G.A. Smith and T. Russo.
- Editors, Spin 2002 - 15<sup>th</sup> International Spin Physics Symposium Proceedings, Y. Makdisi, W. MacKay, A. Luccio.
- Editor, Workshop on Polarized Electron Sources and Polarimeters Proceedings, Y. Makdisi.
- Editor, BNL Report 71228, AGS Super Neutrino Beam Facility Accelerator and Target System Design (Neutrino Working Group Report II), D. Raparia.
- Editor, Member, Physical Review ST-AB, I. Ben-Zvi.
- Editor, Increasing the AGS Polarization Workshop Proceedings, T. Roser.
- Book Article, Chapter on Photoinjectors, "Femtosecond Beam Science", I. Ben-Zvi.

#### Technical Committees:

##### Review of BNL:

- RHIC Polarized Jet Review, November 18-19, 2002, BNL - T. Roser, Y. Makdisi.
- DOE/NASA BAF Review, October 24, 2002, BNL - D. Lowenstein, P. Pile, A. McNerney, J. Becker.
- EBCO Cyclotron Accelerator Readiness Review Team, February 10-14, 2003, BNL - E. Lessard, Chair.
- DOE High-Energy Physics Review, April 22-23, 2003 - D. Lowenstein, T. Roser, P. Pile, I. Ben-Zvi, A. McNerney, J. Hauser.
- DOE/NASA BAF/NSRL Review, June 19, 2003, BNL - D. Lowenstein, P. Pile, A. McNerney, J. Becker.
- DOE RHIC Program Review, July 9-11, 2003, BNL - D. Lowenstein, P. Pile, T. Roser, J. Hauser.
- BSA Review of BNL HENP Program, July 21-22, 2003, BNL - D. Lowenstein, T. Satogata.

##### Service Activity for DOE Program and/or Nat'l./Regional Level:

- USPAS Governing Board - D. Lowenstein.
- US/Russia Joint Coordinating Committee on Fundamental Properties of Matter - D. Lowenstein.
- Member, APS, DPB Executive Committee, F. Pilat.
- Organizing Committee for the 2002 Beam Instrumentation Workshop - G. Smith, T. Russo.
- Organizing Committee for the 2004 Beam Instrumentation Workshop - T. Russo.
- Spallation Neutron Source Accelerator Readiness Review Team, Review of the Front End and Klystron Gallery, October 14-17, 2002, ORNL - E. Lessard, Chair.
- Fermilab Run II Luminosity Performance Review, October 28-31, 2002, Fermilab - T. Roser, D. Lowenstein.
- SNS DOE Review, November 13-15, 2002, ORNL - J. Wei, T. Roser.
- SBIR Phase I Grant Application Review, February 2003, W. Fischer.
- FNAL Accelerator Advisory Committee, Fermilab, February 4-6, 2003 - T. Roser.

- Peer Review Panel for Muon Ionization Cooling Experiment (MICE) Proposal, Rutherford Appleton Laboratory, February 15-18, 2003 - D. Lowenstein.
- J-PARC Accelerator Technical Advisory Committee, Japan, March 7-8, 2003 - T. Roser.
- DOE Review of Fermi National Accelerator Laboratory High Energy Physics Program, Fermilab, March 18-20, 2003 - D. Lowenstein.
- Ions at LHC Review, CERN, March 26-28, 2003 - T. Roser.
- DOE Review of SLAC High-Energy Physics Program, April 9-11, 2003 - I. Ben-Zvi.
- SBIR Proposal Review, April 2003, A. Kponou.
- Peer Review Panel for Muon Ionization Cooling Experiment (MICE) Proposal, Rutherford Appleton Laboratory, April 30-May 3, 2003 - D. Lowenstein.
- SNS DOE Review, May 6-8, 2003, ORNL - J. Wei, T. Roser.
- NSCL Operations Review, Michigan State University, May 7-9, 2003 - D. Lowenstein.
- Technical, Cost and Schedule Review of the HRIBF High Power Target Lab at ORNL, ORNL, May 19-21, 2003 - A.J. McNerney.
- JLab DOE Program Review, June 25-27, 2003, Jlab - T. Roser.
- Fermilab Run II Luminosity Performance Review, July 21-23, 2003, Fermilab - T. Roser.
- Spallation Neutron Source (SNS) Accelerator Readiness Review Team, Review of Linac Tank 1, August 12-14, 2003, ORNL - E. Lessard, Chair.
- SNS ASAC Review, September 22-24, 2003 - J. Wei

BNL Committees:

- C-A Department Committee Listing is on file in the Department Office.
- OPSEC - D. Lowenstein, P. Pile.
- SBMS Steering Committee - D. Lowenstein.
- PAAA Working Group - D. Lowenstein.
- Senior Neutrino Planning Committee - D. Lowenstein.
- Training & Qualifications Steering Committee - D. Lowenstein.
- BNL Integrated Security Group - D. Lowenstein.
- ALD for ESH&Q Selection Committee - D. Lowenstein.
- Employment Benefit Committee - D. Lowenstein.
- BNL Envoy Committee - J. Scott.
- C-AD/Physics Accelerator Experiments Approval Committee (AEAC) - J. Wei, W. Fischer, S. Peggs, F. Pilat, P. Yamin, T. Kirk, D. Lowenstein, P. Pile, T. Roser.
- BNL Lecture Committee - F. Pilat.
- Contract Administration Committee - J. Hauser.
- Credit Card Committee - J. Hauser.
- Search Committee for a Deputy Purchasing Manager - J. Hauser.
- PG&A Review Committee - J. Hauser.
- Laboratory Environmental Safety and Health Committee - E. Lessard, Chair.
- BNL Radioactive Drug Research Committee - E. Lessard.
- BNL Radiological Control Working Group - E. Lessard.
- BNL Safety Improvement Team - E. Lessard.
- BNL Institutional Review Board - E. Lessard (alternate member).

- BNL Labor Negotiations Committee - A. McNerney, G. McIntyre.
- BNL Consolidation Team - A. McNerney
- Laboratory Communication Focus Group - A. Herscovitch.
- Continuity of Operations Committee - D. Phillips.
- WOSH (Worker Occupational Safety and Health) Committee - C.J. Liaw, D. Weiss, etc.....

**Additional Comments: (Optional)**

-NA-

## FY 2003 Year End Self Evaluation Report

### IDENTIFICATION:

Critical Outcome:	1.0	Excellence In Science & Technology Success in Constructing and Operating Research Facilities
Objective:	1.3	
Performance Measure:	1.3.1	High Energy and Nuclear Physics
Metric:	1.3.1.1	Collider Accelerator Department
Responsible:	C. Anderson	OMS Proj Mngr: Bruce Miller    % of Critical Outcome:

### APPENDIX B DESCRIPTION:

Determine whether the construction and commissioning of the Collider Accelerator Department of High Energy and Nuclear Physics new facilities is on-time and within budget, whether facility performance specifications and objectives are achieved, the reliability and safety of operations, adherence to planned schedules, and the cost-effectiveness of maintenance and facility improvements. Assess the quality, innovation and achievements in designing and developing new facilities that will provide the next generation of research tools. Consider whether the user access program is effective, efficient, and user-friendly, the quality of the proposal evaluation process, the strength and diversity of user participation, the productivity of the research supported, both in science and technology, and the level of satisfaction among user groups.

### RESULTS:

### ACCOMPLISHMENTS:

#### Budget and Schedule Performance:

C-A performance was outstanding.  
Financial performance was outstanding; all budgets were controlled and adhered to. Cost plans were on target.

#### Facility Performance Assessment:

C-A performance was outstanding.  
RHIC technical goals for FY 2003 were all either achieved or exceeded.  
Performance:

- RHIC asymmetric operation, deuteron-gold, became operational
- RHIC operational with deuteron-gold and polarized proton beams at experiment requested collision energy, all five experiments collecting data and publishing
- Fifth experiment, PP2PP, brought into operation and collecting p-p data
- Peak luminosity approx.  $5 \times 10^{26} \text{cm}^{-2} \text{sec}^{-1}$  (Au-Au),  $6 \times 10^{30} \text{cm}^{-2} \text{sec}^{-1}$  (p-p),  $6 \times 10^{28} \text{cm}^{-2} \text{sec}^{-1}$  (d-Au).
- Average store luminosity approx.  $1.5 \times 10^{26} \text{cm}^{-2} \text{sec}^{-1}$  (Au-Au),  $\sim 3 \times 10^{30} \text{cm}^{-2} \text{sec}^{-1}$  (p-p),  $2 \times 10^{28} \text{cm}^{-2} \text{sec}^{-1}$  (d-Au).
- AGS provided polarized protons with 50% polarization
- Acceleration of polarized protons to 100 GeV with average 30% polarization
- RHIC Spin Rotators commissioned, providing first longitudinally polarized p-p collisions.
- Storage times up to 12 hours, depending on species (intrabeam scattering limited)
- Refill time of 45 minutes between stores

- NASA Space Radiation Laboratory construction completed and four beams commissioned. (C, Fe, Ti, H)

**Facility Availability:**

HEP (AGS) = Not funded in FY2003

NP (RHIC) = 77.95%

**User Survey Results:**

See T. Kirk

**Additional Comments: (Optional)**

## FY 2003 Year End Self Evaluation Report

<b>IDENTIFICATION:</b>			
Critical Outcome:	1.0	Excellence In Science & Technology	
Objective:	1.4	Effectiveness and Efficiency of	
Performance Measure:	1.4.1	Research Program Management	
Metric:	1.4.1.1	High Energy and Nuclear Physics	
		Collider Accelerator Department	
Responsible:	D. Lowenstein	OMS Proj Mngr:	Bruce Miller    % of Critical Outcome:
<b>APPENDIX B DESCRIPTION:</b>			
Determine the effectiveness and efficiency of the Collider Accelerator Department High Energy and Nuclear Physics research program management.			
<b>RESULTS:</b>			
	Score (0~4.0): 3.85		
<b>ACCOMPLISHMENTS:</b>			
Management Goals and Processes for Fiscal Year 2004:			
<ul style="list-style-type: none"> <li>Accelerator systems will continue to be improved to enhance research quality.</li> <li>Accelerator operations will continue to be aligned with DOE mission.</li> <li>Facility operations enhancements reviewed and approved by the DOE Division of Nuclear Physics</li> <li>WFO planning to continue with NASA (AGS &amp; NSRL) and with non-federal entities for a RCMS.</li> <li>WFO planning to continue with SNS Project</li> </ul>			
New Associates Scientists (or Above) Hired:			
One Senior Scientist and one Associate Scientist			
New Research Associates Hired:			
Two Research Associates (junior scientists)			
Significant Improvements in Infrastructure and Management Systems that Support Research:			
<ul style="list-style-type: none"> <li>RHIC: cryogenic system, facility infrastructure, power supplies etc. have been repaired and implemented. Approx. 2 years at present funding left to go.</li> <li>AGS: Siemens MG Set installation completed after failure caused by General Electric Corporation faulty QA program.</li> <li>Booster: slow extraction system operational. BAF/NSRL completed on schedule and below budget, successfully commissioned and operational</li> <li>LINAC: Polarized proton ion source is operational at record polarization</li> <li>BAF/NSRL: successfully operated for FY 2003 running cycle</li> <li>Proposal for EBIS/LINAC based preinjector for RHIC prepared.</li> <li>Tandem: Upgraded to allow delivery of deuteron beams to RHIC</li> </ul>			
Safety Enhancements:			



- Implemented the International Labor Organization Guidelines for Occupational Safety and Health Managements Systems, ILO-OSH-2001. These guidelines enhance ISM principles with additional principles that are similar to the ISO 14001, which is used for the Environmental Management System. These additional principles promote worker participation and continual improvement, which in turn increases worker protection.
- Continued consolidation of the Safety Assessment Documents for the Collider Accelerator complex. The single unified document is about 60% complete.
- Updated four Accelerator Safety Envelopes (ASEs) currently in use at the complex. The new ASEs meet DOE and SBSM requirements and specify the minimum necessary components and monitoring devices to allow operation. The major changes were to modernize the AGS ASE and to include specific actions in all ASEs whenever minimums are not met.
- Obtained approval for routine operations of the Tandem to Booster Line with low mass ions. In addition, confirmed the approval for operation of RHIC with deuterons and other ions. The staff developed and implemented the required administrative controls and engineered safeguards to operate in these modes safely. The approval process was conducted in compliance with the provisions of DOE Order 420.2, Safety of Accelerator Facilities and the BNL Accelerator Safety Subject Area.
- Obtained approval for routine operations of the NASA Space Radiation Laboratory (NSRL). The staff developed and implemented the required administrative controls and engineered safeguards for commissioning the beam line, for commissioning the experimental program and for routine operation of NSRL. The approval process was conducted in compliance with the provisions of DOE Order 420.2, Safety of Accelerator Facilities and the BNL Accelerator Safety Subject Area.
- Maintained ISO 14001 certification.

#### Steps Toward Development of Next Generation Facilities and Research Tools:

- RHIC II: Electron cooling R&D vigorously underway with DOE support, including JLab, TJNAF and BINP
- ERHIC: Conceptual design commenced in collaboration with Bates Lab and BINP, with ZDR completion in FY 2004
- Neutrino Source: Conceptual design commenced
- RCMS: Conceptual design was completed.
- RSVP: Canadian funding approved and awaiting funding. NSF funding set for FY 2006 (possibly sooner)
- EBIS: R&D successfully completed. Funding requested.

#### Discussion of Make up of the Facility User Community:

See T. Kirk

#### Steps toward Improvement of Proposal Quality and Opportunities:

Not Applicable

#### List the Number of International Collaborations:

There are six International Collaborations:

- CERN (Switzerland): Collider Beam Dynamics
- KEK (Japan): High Intensity Proton Synchrotron Systems
- TRIUMF (Canada), KEK (Japan) INR (Moscow-Russia): Polarized Proton H-minus Source

- ITEP: Polarized Jet
- BINP (Novosibirsk-Russia): EBIS Ion Source Electron Gun
- BINP (Novosibirsk-Russia), AES, JINR (Dubna-Russia), TJNAF: RHIC Electron Cooling (RHIC II)

#### List of Projects/Programs Involving Collaborations with Others:

##### Non-DOE Funded Programs That Connect To DOE:

- NASA radiobiology at AGS and NSRL
- RCMS (Pennsylvania), Loma Linda University, etc. Medical Synchrotron
- NSF High-Energy Physics RSVP experiments (R&D funding, construction begins in FY 2006) TRIUMF etc.

##### Collaborations with Other Laboratories or Universities:

- SNS Project (ORNL)
- KEK (Japan) High Intensity Proton Synchrotron Systems
- TRIUMF (Canada), KEK (Japan) INR (Moscow-Russia) Polarized Proton H-minus Source
- ITEP Polarized Jet
- BINP (Novosibirsk-Russia) EBIS Ion Source Electron Gun
- BINP (Novosibirsk-Russia) AES, JINR (Dubna-Russia), TJNAF, RHIC Electron Cooling (RHIC II)
- University of Pennsylvania, Stony Brook RCMS (Rapid Cycling Medical Synchrotron)
- ORNL, ANL, LANL, LBNL, TJNAF on SNS Project
- CERN (Switzerland) Collider Beam Dynamics
- Bates (MIT) eRHIC R&D

#### Number of Users by Facility:

The number of users that are administered through the RHIC & AGS User's Center are as follows:

AGS	422
ATF	34
RHIC	1084
Tandem	143
Total	1683

#### List of WFO Projects and Sponsors:

- Booster Application Facility: NASA (completed FY2003)
- NASA Space Radiation Laboratory: NASA (operations begun FY 2003)
- Genetics and Epigenetic Effects: NASA
- Proton Radiography: NASA (LANL)

Staff Profile:	Tenured:	8	Professional:	106
	Continuing:	25	Technical:	224
	Term:	9	Administrative:	25

	Research Associates :	4	Management:	16
	Scientific Total:	46	Information Tech:	43
			Total:	460

\*Note: Riken Fellows, Goldhaber Fellows, and Visiting Scientists included with Research Associates.

Funding Profile for the Last Seven (7) Years	2003:	\$132.7M
	2002:	\$133.1M
	2001:	\$127.8M
	2000:	\$116.5M
	1999:	N/A
	1998:	N/A
	1997:	N/A

Other Awards:

*None*

Other Publications, Citations, Press Releases for this Fiscal Year::

*None*

Number of Co-Authored Papers, CRADS, etc.:

- CRADA # BNL-C-01-03, Non-Vacuum Electron Beam Welding with Accelaron Inc.
- CRADA # BNL-C-02-07, Accelerator design of a proton therapy facility with Accel Instruments, GMBH
- CRADA # BNL-C-03-09, Highly Stripped Ion Sources for MeV Ion Implanters

Co-Authored Papers:

The majority of C-A publications have co-authors. As stated in Metric 1.1.1.1, Publications for FY 2003, C-A has a total of 206 publications that include peer reviewed and refereed publications, internal reports, invited papers, conference proceedings and other publications. The list of published documents is available from the C-A Department Chairman's Office

**Additional Comments: (Optional)**